





## Svalbard ecosystems under pressure through climate and goose grazing: Proxy development for goose impact based on phytoliths.

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**Hypothesis** 

Svalbard ecosystems are under heavy pressure through climate warming and through exponentially increasing goose populations. The co-occurring changes in climate and grazing birds raises the question whether warming and/or overgrazing leads to irreversible ecosystem shifts.

While climate driven vegetation changes can be quantified by available palaeoecological methods, the detection of goose grazing intensity requires new proxies.

The aim of this project is to utilize phytoliths (microscopic silicious plant remains) as 'goose impact' proxy. We will study the qualitative and quantitative distribution of phytoliths in (surface) sediment samples from heavily grazed and ungrazed areas on Svalbard (Fig.1). The phytolith distribution is expected to be a good indicator of distinct vegetation compositions (Fig. 2).



**Fig. 1**: Goose exclosure plots on Ny-Ålesund. These plots hold the potential vegetation without any goose grazing. Grazed areas around plots show the heavily disturbed vegetation cover.

**Fig. 2**: Potential phytolith assemblages in ungrazed vs. grazed areas. Preferential diet of geese changes abundancies of plant groups and total amount of biomass.



**Fig. 3:** Stomatal (a) and epidermal (b) phytoliths from *Equisetum arvense*.

**Fig. 4:** A group of epidermal and stomatal phytoliths from *Vaccinium uliginosum*.

**Fig. 5:** A collection of elongated phytoliths from *Poa alpina*.

## Outcomes

The outcomes will reveal if there is a quantifiable difference in phytolith assemblages and concentration from areas that are affected by geese versus undisturbed sites. This proxy can subsequently be used to distinguish periods with goose pressure in the past by sediment core analysis.

The project functions as a pilot study for further investigations where the proxy will be applied to lake sediment cores collected during the SEES.NL expedition. We want to establish the history of climate- and goose-impact over the past centuries.